Earth Science Technology Office (ESTO)

Technology Strategy Team (TST) Meeting

November 28, 2001

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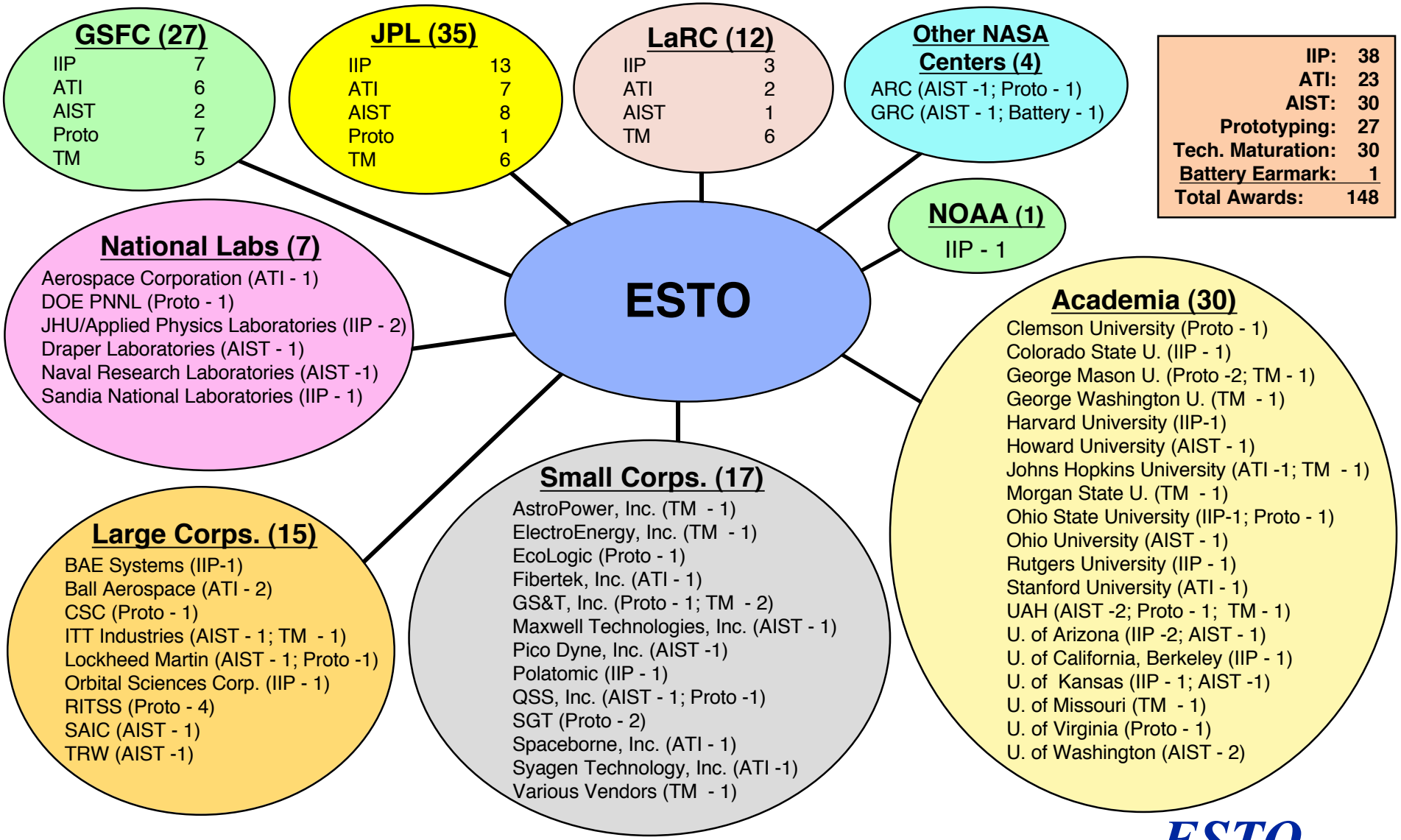
Program Manager

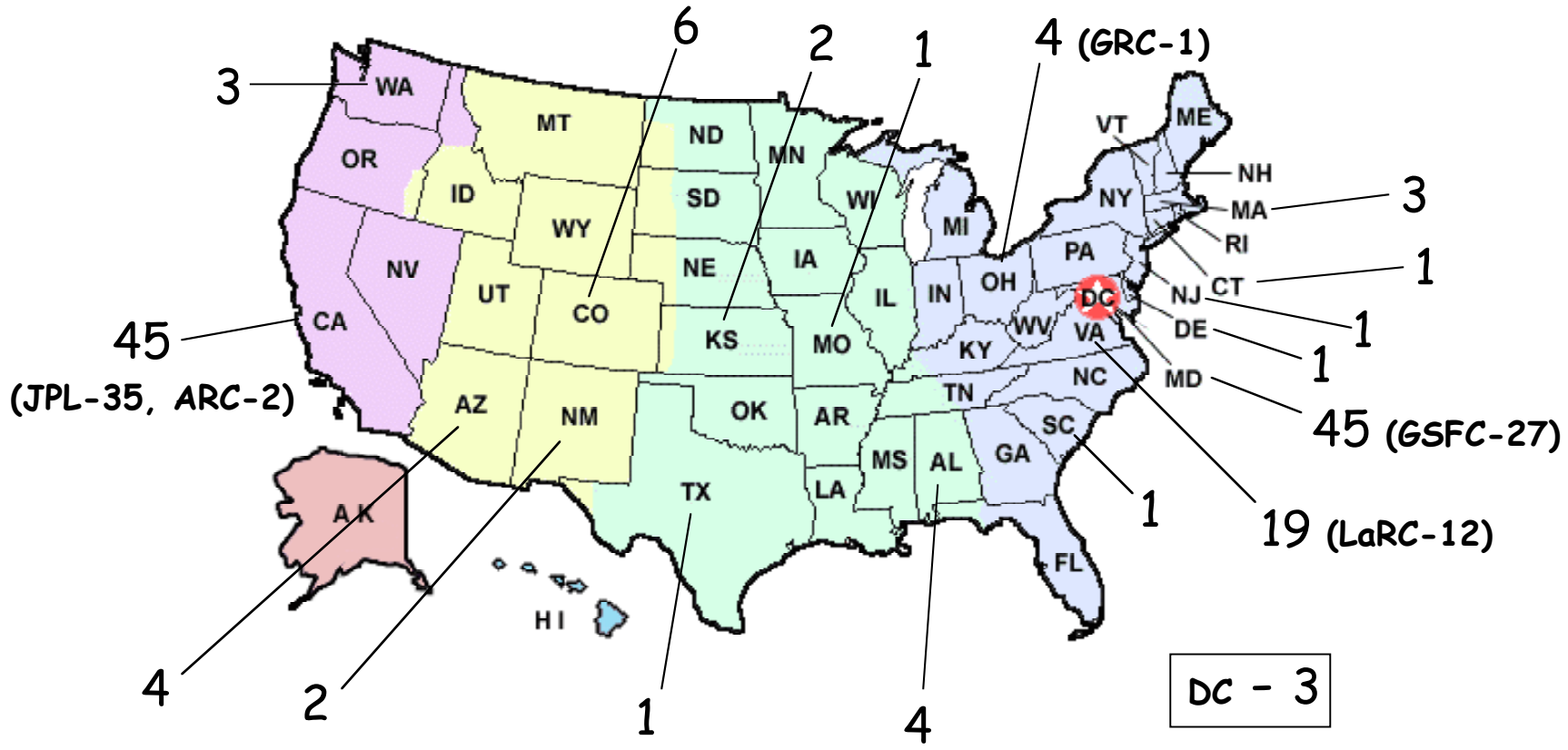
Topics

- ESTO Technology Investments
- Earth Science Questions and Measurements
- ESTO NRA Summary
- Advanced Component Technology (ACT) Program NRA
- Earth Science Technology Conference
- RASC Highlights
- ES Economic Benefits Study
- ES Vision Team
- NMP EO-1 Status
- Performance Metrics: FY 01 Results/FY 02 Commitment

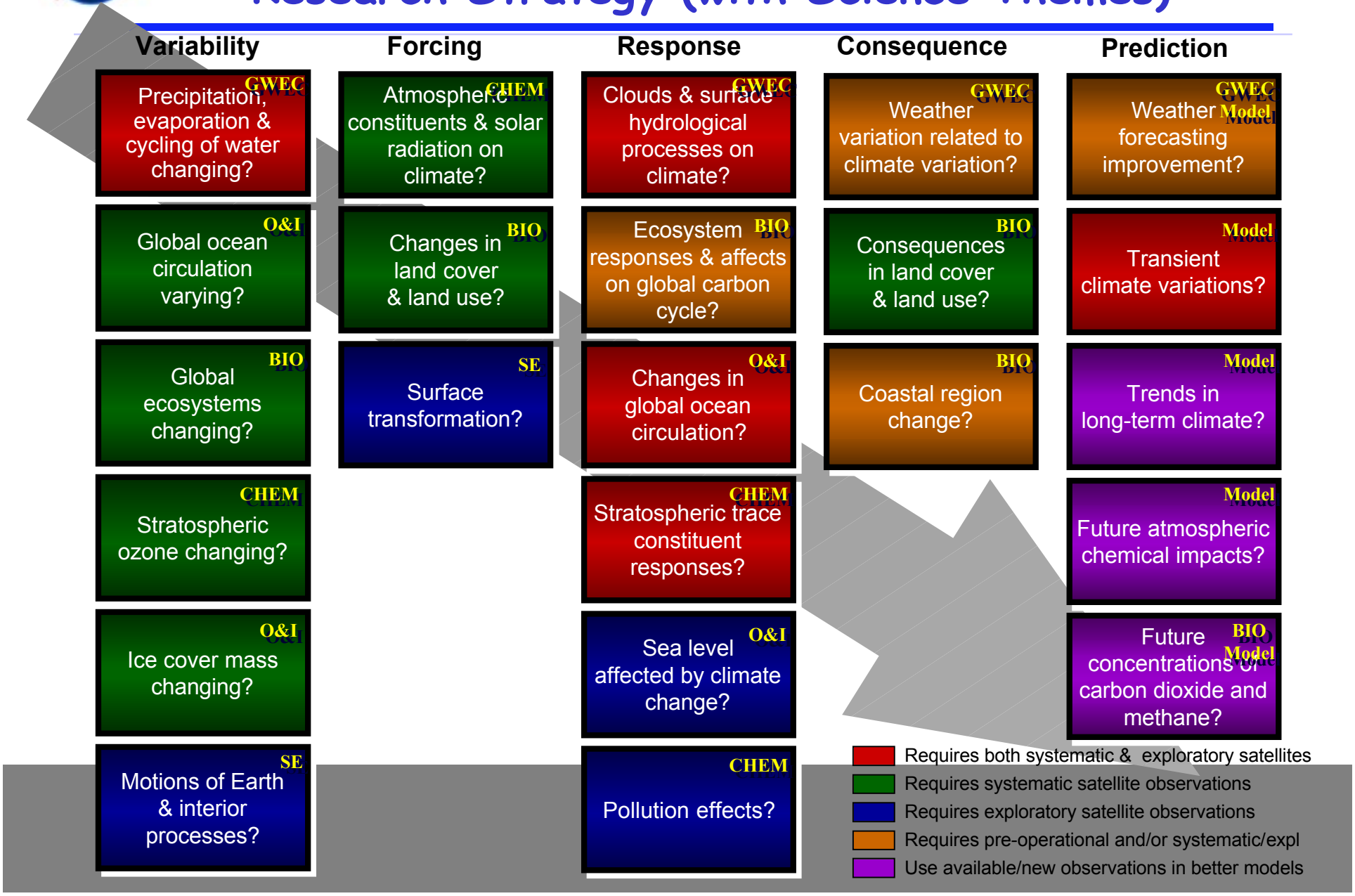
ESTO Technology Investments



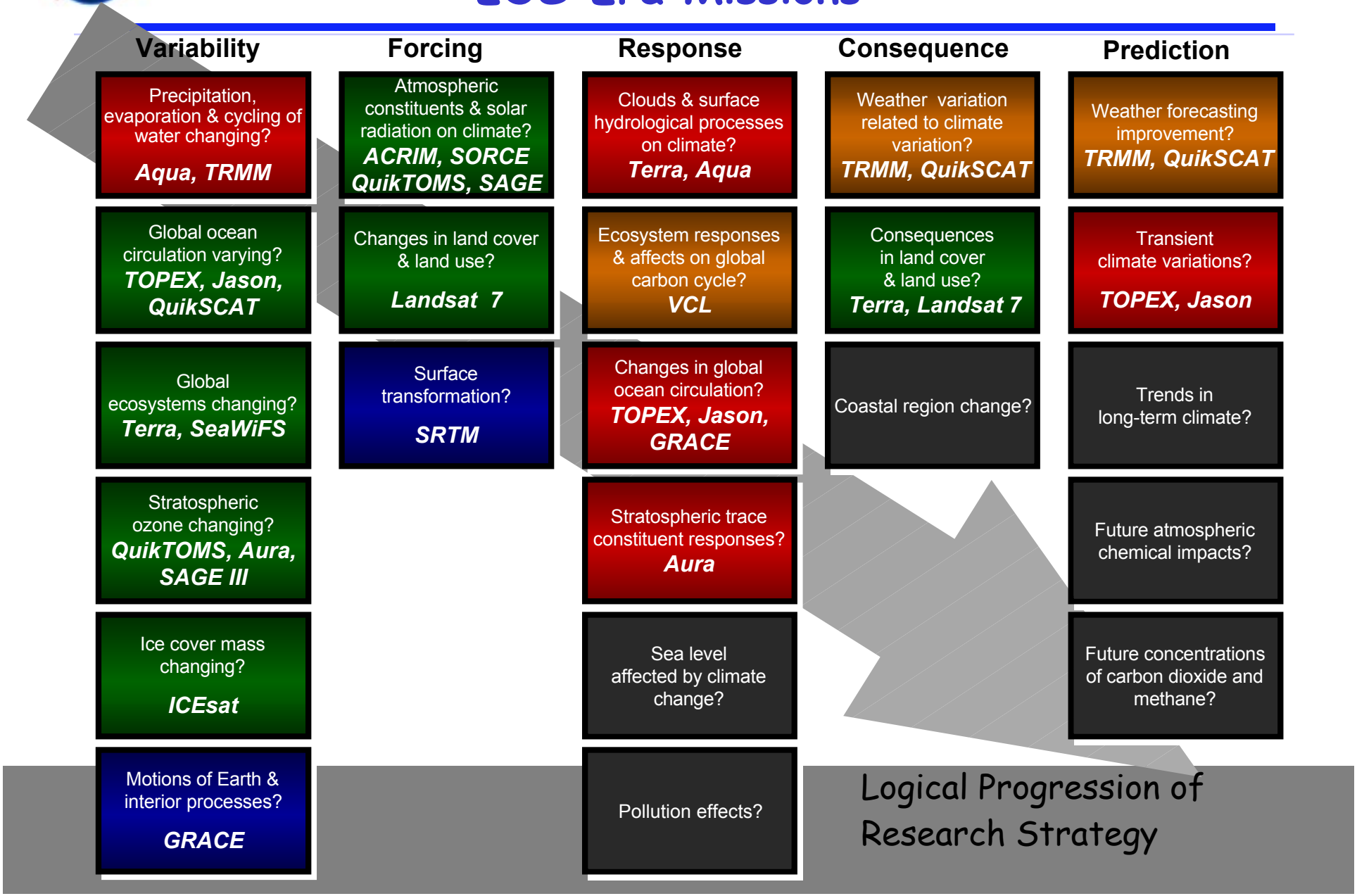
ESTO Technology Investments
(Distribution by State)



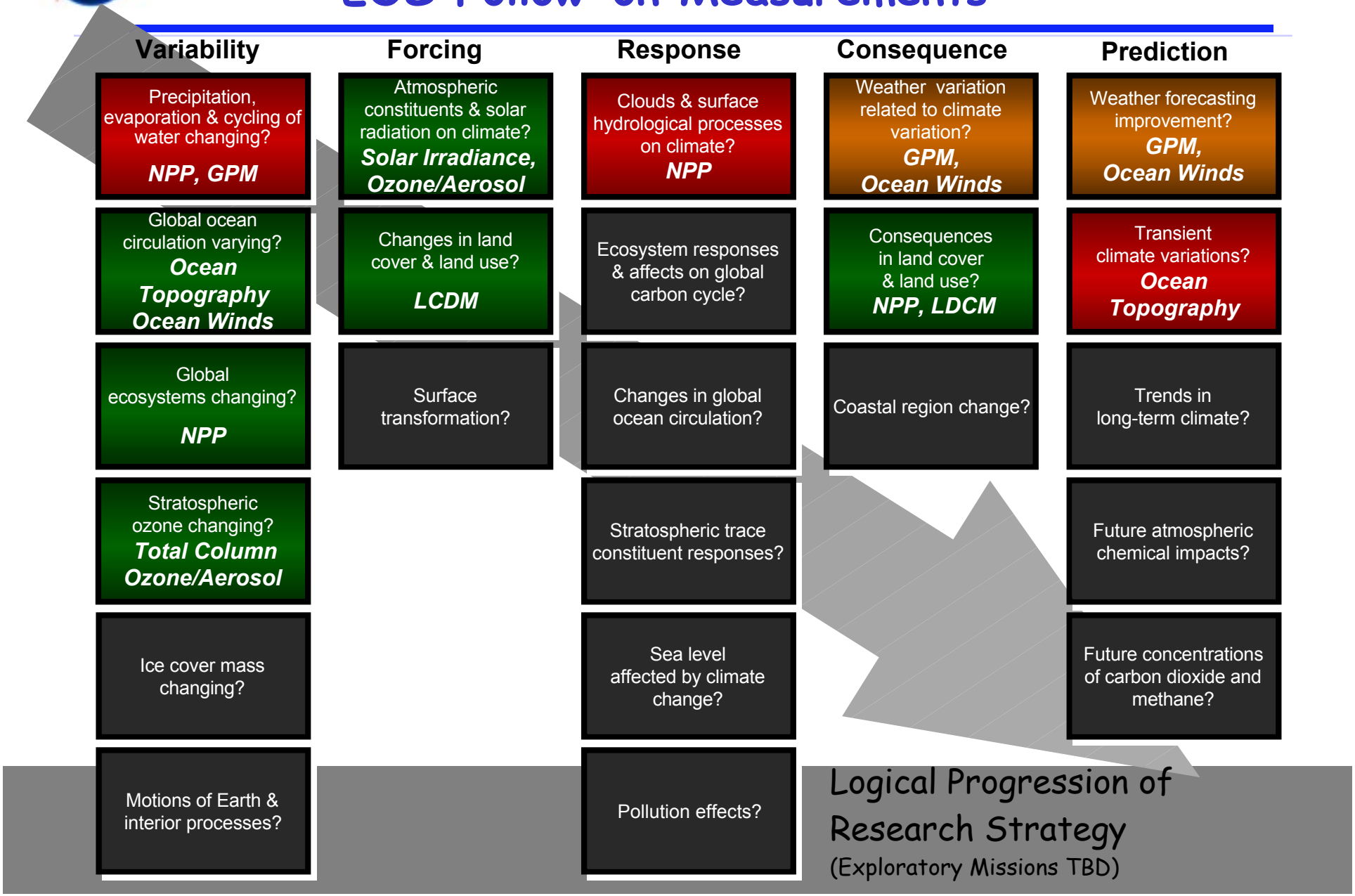
Deriving Measurement Requirements from the Research Strategy (with Science Themes)



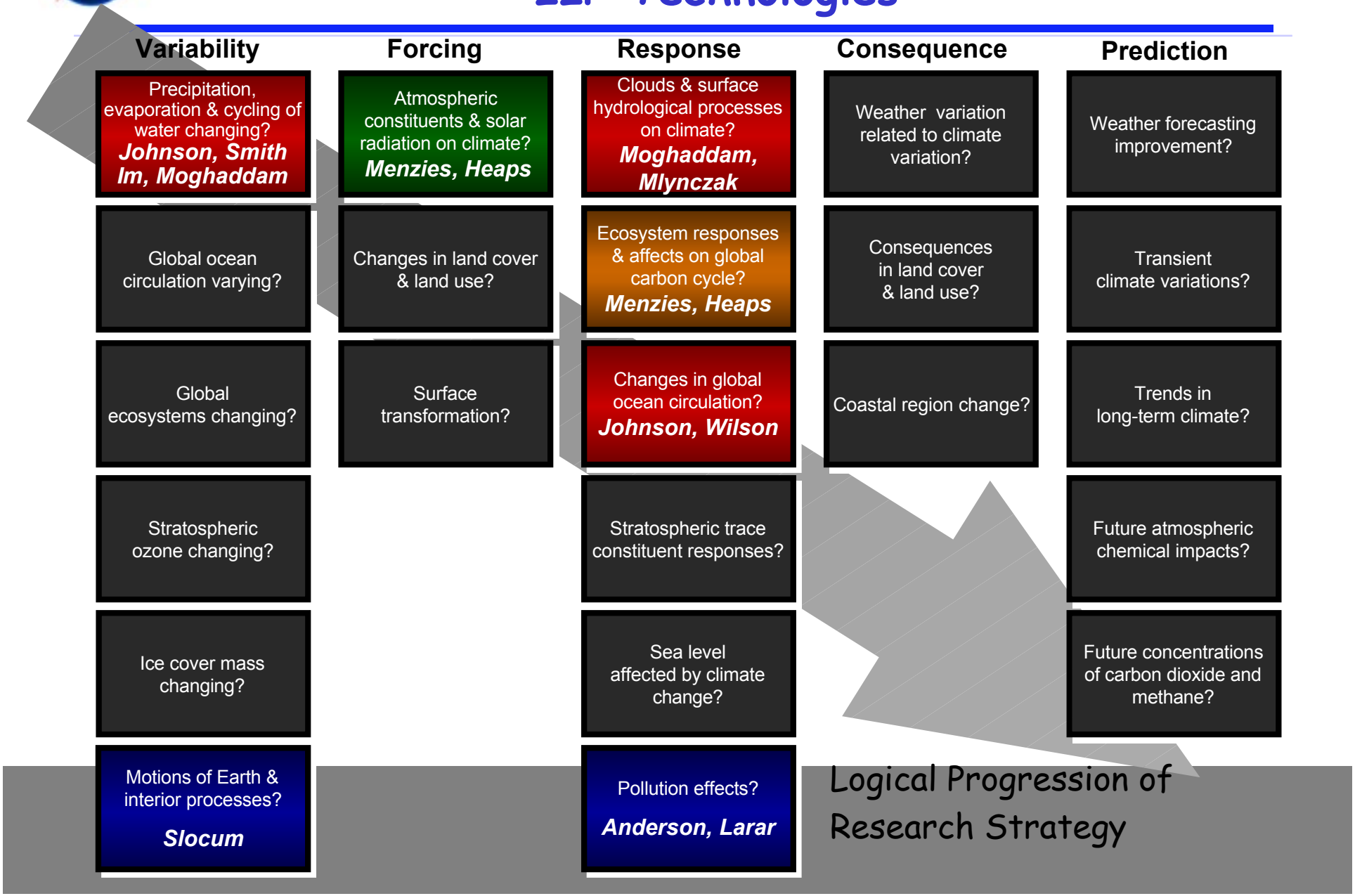
Science Questions Addressed by EOS Era Missions



Science Questions Addressed by EOS Follow-on Measurements



Science Questions Addressed by FY 01 IIP Technologies



Exploratory Measurement Needs

How are global precipitation, evaporation, and the cycling of water changing? (V1)

What are the motions of the Earth and Earth's interior? (V6)

What trends in atmospheric constituents and solar radiation are driving global climate? (F1)

How is the Earth's surface being transformed…? (F2)

What are the effects of clouds and surface hydrological processes on climate change? (R1)

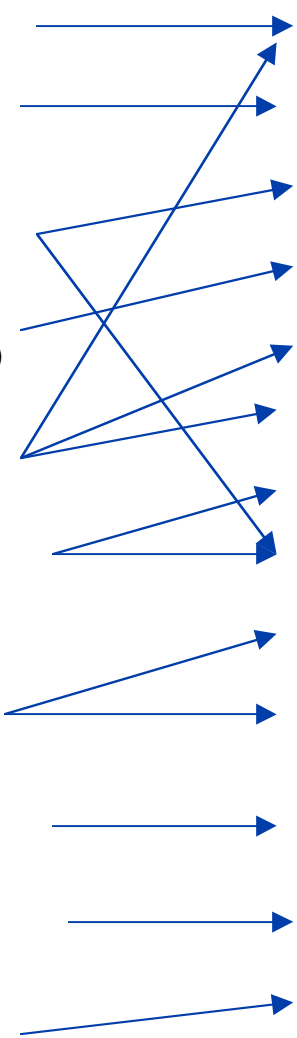
How do ecosystems respond to and affect global environmental change and the global carbon cycle? (R2)

How can climate variations induce changes in global ocean circulation? (R3)

How do stratospheric trace constituents respond to change in climate and chemical composition? (R4)

How is global sea level affected by climate change? (R5)

What are the effects of regional pollution on the global atmosphere…? (R6)



Soil moisture

Gravity field (*GRACE*)

Stratospheric aerosols *(Calipso)*

Land surface topography/deformation

Cloud particle properties *(Cloudsat)*

Snow cover/Freeze-thaw transition

Biomass changes *(VCL)*

Carbon sources & sinks

Ocean salinity

Sea ice thickness

Atmospheric properties in tropopause region

Ice sheet velocity fields

Tropospheric ozone & precursors

ESTO NRA Summary

NRA Solicitations	No. of Proposals	Total M$	
IIP Phase 1	**123**	**$ 209.2**	
Selected 27 (22%)		**$ 38.8**	**18.5%**
ATI Component Technology	**104**	**$ 75.7**	
Selected 23 (22%)		**$ 17.0**	**22.5%**
AIST	**111**	**$ 104.0**	
Selected 30 (27%)		**$ 26.0**	**25.0%**
IIP Phase 2	**64**	**$ 176.8**	
Lasers	20	$ 65.1	
Microwave Radiometers	12	$ 29.2	
Radars	11	$ 37.1	
Other	21	$ 45.4	
Selected 11 (17%)		**$ 29.6**	**16.7%**

ACT NRA Key Technologies

Antenna Technologies:

- Ultra lightweight large structural components such as deployable and/or inflatable booms, membranes and apertures for radiometer and synthetic aperture radar
- Lightweight microstrip antenna technologies for microwave systems
- Steerable microwave antenna

Electronics Technology:

- Low mass/low power stable RF electronics
- High speed/low power digital correlators
- Millimeter and submillimeter receiver technologies
- Low power, high density control electronics
- Stable power amplifiers and receivers

Optics Technology

- Optical system transform spectrometers (minimal moving parts)
- Light weight deployable concepts for large aperture systems
- Compact light weight optical systems

Detector Technologies:

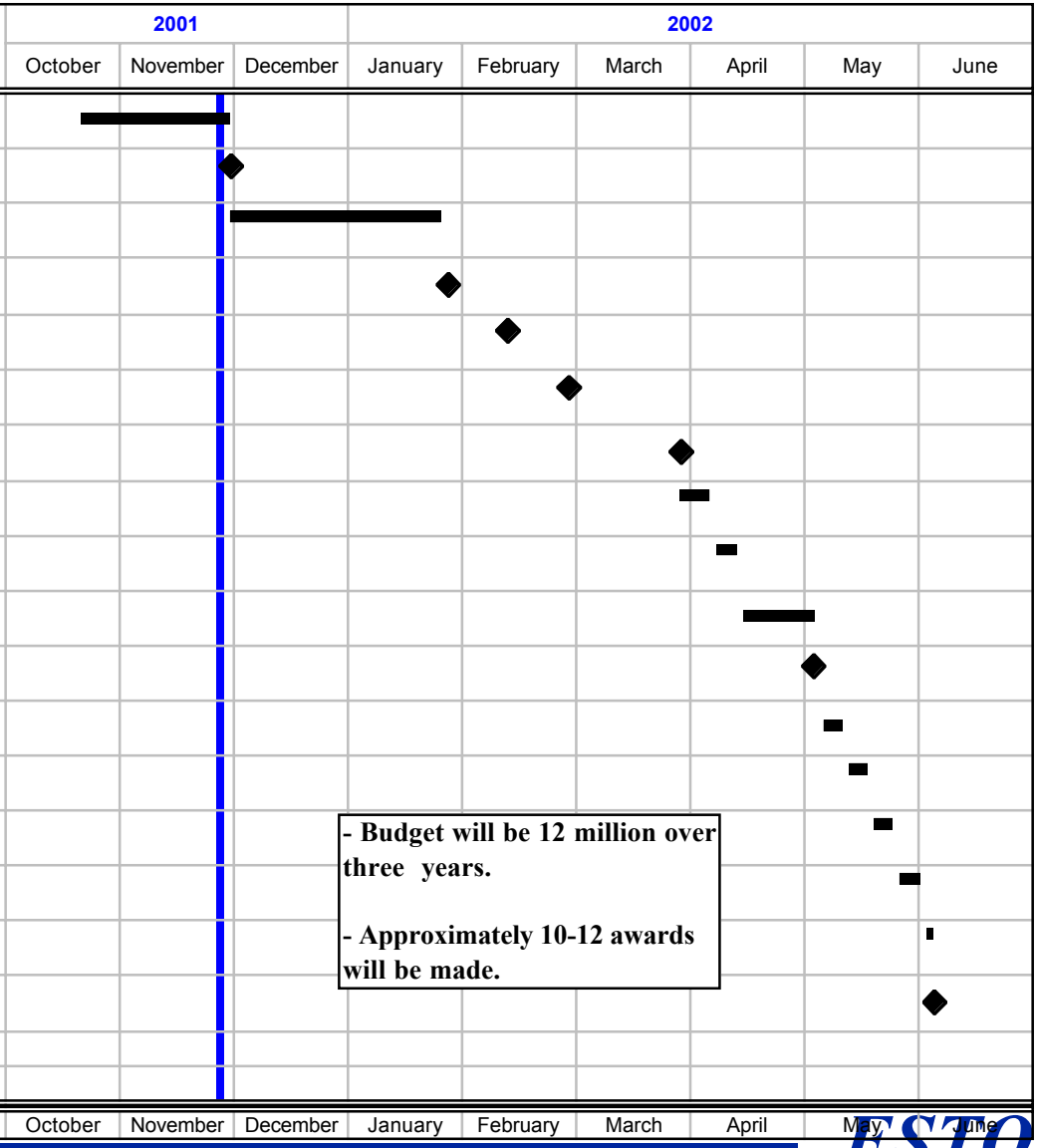
- Large Format arrays (VNIR, SWIR, FIR, and UV)
- Cryocooler technologies
- Linear Variable etalons

ACT NRA Science Themes

Science Theme	Measurement	Target Technologies	Future Applicable Measurements
Global Water & Energy	Soil Moisture/Salinity	Ultra light-weight large structural components such as deployable and/or inflatable booms, membranes and apertures for radiometer and synthetic aperture radar Low mass/low power stable RF electronics High speed/low power digital correlators Millimeter and submillimeter receiver technologies	Future soil moisture/salinity Measurement
	Global Precipitation	Ultra light-weight large structural components such as deployable and/or inflatable booms, membranes and apertures for radiometer and synthetic aperture radar Low mass/low power stable RF electronics High speed/low power digital correlators	Follow-on Global Precipitation Measurement
Oceans and Ice	Ocean Surface Winds	Low power, high density control electronics Steerable microwave antenna Millimeter and submillimeter receiver technologies	Ocean Wind; NPOESS Measurement
	Ocean Topography	Stable power amplifiers and receivers	Ocean Topography Measurement
Atmospheric Chemistry	Total Column Ozone	Optical system transform spectrometers (minimal moving parts) Light weight deployable concepts for large aperature systems Compact light weight optical systems Large format arrays (VNIR, SWIR, FIR and UV) Cryocooler tchnologies Linear Variable etalons	
Global Carbon Cycle	CO2 Column abundance and profile	Large format arrays (VNIR, SWIR, FIR, and UV) Optical system transform spectrometers (minimal moving parts)	NPOESS Measurement
Solid Earth Science	Topography and Surface Change	Optical system transform spectrometers (minimal moving parts) Low mass/low power stable RF electronics Compact light weight optical systems	Future land cover measurement

ACT NRA Schedule

Activity Name	Start Date	Finish Date
Start NRA write-up	10/22/01	11/29/01
Submit to Headquarters	11/30/01	
Hq Approval process	11/30/01	1/25/02
CBD announcement	1/28/02	
NRA release	2/12/02	
Bidder's Conference	2/27/02	
Proposals due	3/29/02	
Proposal binning/sort	3/29/02	4/5/02
Confirm reviewers/send prop.	4/8/02	4/12/02
Review proposals/inputs to Sys-E-fus	4/15/02	5/3/02
Comments in system	5/3/02	
ESTO panel-Org. & distribute comments	5/6/02	5/10/02
ESTO panel consolidation	5/13/02	5/17/02
Inputs to Kurt/prepare HQ pre.	5/20/02	5/24/02
Present to HQ	5/27/02	5/31/02
Prepare announcement	6/3/02	6/4/02
Announce selections	6/5/02	



Earth Science Technology Conference

Results

- 69 papers presented from the Earth Science Technology portfolio of investments

- Total Registration 357
  - NASA 138
  - Industry 124
  - Universities 38
  - Labs 25
  - Associations 19
  - Other Government 13

- Conference was well received and provided an excellent opportunity to communicate current technology developments and accomplishments

RASC Highlights

The RASC FY02 call produced 32 proposals. Of 6 ES proposals 5 were selected:

- Space-Based Imaging Interferometry (David Leisawitz - GSFC)
- Fresnel Lens for Gamma Ray astronomy (Neil Gehrels - GSFC)
- Study of revolutionary ES architectures (Dr. Warren Wiscombe - GSFC)
- Comet and asteroid protection system (Dan Mazanek - LaRC)
- Planetary body maneuvering (Dr. George Schmidt - MSFC)

RASC kickoff of ES FY02 studies was held at GSFC on Nov 2. Jeff Antol (LaRC) briefed the Group 4 task implementation and PI's gave short overviews of their study proposals.

RASC process is underway for FY03 studies. Call is open with a target deadline of mid-Feb.2003.

Detailed RASC info is on http://centauri.larc.nasa.gov/rasc/

ES Economic Benefits Study

ES Economic Benefits Study

- A summary of the Phase I study findings will be published in the *Space Policy Journal*. Dr. Ray Williamson (our study Lead) will chair the Remote Sensing in Environmental Policy Session at the IGARSS 2002 meeting in Toronto (June 2002) and will present the results there.
- Phase II of the study is underway and should be completed September 2002.
- A workshop is planned for mid January to gather community input for the study.

ESE Vision Team

ESE Vision Development

- A Vision Team Steering Group was recently convened under the leadership of Dr. Warren Wiscombe (GSFC). This group will grow to include membership from HQ, NASA Centers, and the ESSAAC.
- Five work-group topics have been defined:
  - Long Term Climate
  - Medium-term Climate
  - Extreme Weather
  - Biosphere
  - Solid Earth
- Workgroup Lead assignments are being worked.

NMP EO-1 Status

EO-1 Extended Mission

- NASA committed to extend EO-1 mission based on positive response from August workshop and DOD Space Command expressed interest.
- NASA received letter from DOD formalizing intent
- AF working to define actual data request specification

NASA extended validation activity with external cooperation

- EO-1 Extended Mission start December 1, 2001
- NASA maintain EO-1 mission and technology validation program
- DOD, NASA and public benefit in sharing cost, NASA to develop pricing policy for reimbursables
- Data Users Workshop scheduled November 28, 2001 at BWI Marriott.
  - Co-sponsored by NASA and the U.S. Geological Survey (USGS).
- NMP Present to NASA Earth Science Administrator, Dr. Ghassem Asrar for final approval in December 2001.

FY '01 Performance Metrics- ESTP/NMP/HPCC-ESS

		NOT MET	MET	EXCEEDED
*1. At least twenty-five (25) percent of funded development tasks advance by at least one technology readiness level (TRL) each year.	E N H	○	○	●
*2. Annual transfer of at least one (1) technology development to a commercial entity; infusion into a remote sensing or in situ mission; or infusion into the information systems development.	E N H	○	○	●
3. Annually establish at least one joint agreement with a program external to NASA, or within NASA, but external to ESE, that results in the inclusion of at least one (1) ESE technology requirement.	E	○	○	●
4. Technology funding strategy that results in at least 25% of TRL 5-6 and no more than 20% TRL 1-2, annually.	E	●	○	
5. Annual update of the data/information residing in the Technology Integrated Planning System(TIPS) by ESTO and the Agency-level Technology Inventory.	E N H	○	●	
6. Perform at least one annual update of the Integrated Technology Development Plan by ESTO	E N H	○	●	
7. Annual update of the Capability Needs for Science, Applications and Technology (CN-SAT) based on the currently approved Science and Applications Requirements	E	○	●	

FY '01 Performance Metrics- ESTP/NMP/HPCC-ESS

1. **9 of 26 (35%) IIP advanced at least 1 TRL in FY '01**
   - Degnan, GSFC TRL 4->5
   - Whiteman, GSFC TRL 4->5
   - Diner, JPL TRL 4->5
   - Herman, Univ. of Ariz. TRL 3->4
   - Boncyk, JPL TRL 3->4
   - Njoku, JPL TRL 3->4
   - Lambrigtsen, JPL TRL 4->5
   - Lichten, JPL TRL 2->3
   - Zawodny, LaRC TRL 4->5
2. **Infusion**
   - PR-2 (airborne) was selected to fly on the DC-8 and HAMSR was selected to fly on the NASA ER-2 during the CAMEX-4, a multi-agency field campaign to study hurricanes in August 2001.
3. **Partnerships**
   - Joint Study (matching funds) with SBTP High Data Rate Delivery Thrust area to study communications architectures and requirements for constellations. Study to also include distributing the computational resources among the vehicles.
   - Joint effort with Code M (HQ), SOMO Technology program and GRC to add enhanced capabilities to SOMO Lower Power Transceiver (LPT). Capabilities to be added, include: ungraded processors, S-band cross-links, and a Cisco mini-router. This joint effort also leverages the ESTO AIST NRA award to ITT to develop enhancements to the LPT for increased radiation (SEU) tolerance.

FY 02 Performance Metrics Commitment

1. Annual update of the data/information residing in the Technology Integrated Planning System (TIPS) and the Agency-level Technology Inventory.

2. Annual update of the Capability Needs for Science, Applications and Technology (CN-SAT) based on the currently approved Science Research Plan and the Applications Strategic Plan (Draft).

3. At least twenty-five percent of funded development tasks advance by at least one technology readiness levels (TRL) each year.

4. Annually transfer at least 5% of technologies completing development: to a follow-on technology program for further advancement; to a commercial entity; infusion into a remote sensing or in situ mission; or, for infusion into actual information systems development.

5. Technology funding strategy that results in at least 25% investment in TRL 5-6 and no more than 20 % investment in TRL 1-2, annually.

6. Perform at least one annual update of the Integrated Technology Development Plan.

7. Annually establish at least one joint agreement with a program external to NASA, or within NASA, but external to ESE, that results in the inclusion of at least one ESE technology requirement.


Technology is Our Future
ESTO